

# Establishing Nutrient Criteria to Protect Virginia Water Quality Under the Clean Water Act

*23 October 2006  
DEQ Stakeholders  
DEQ Piedmont Region  
Glen Allen, VA*

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## **Academic Advisory Committee (AAC) to Va. Dept. of Environmental Quality (DEQ):**

- ✓ Organized by Virginia Water Resources Research Center in 1998.
- ✓ Comprised of faculty from state Universities.
- ✓ DEQ requested assistance in developing freshwater nutrient criteria from the AAC.

## What are “criteria”?

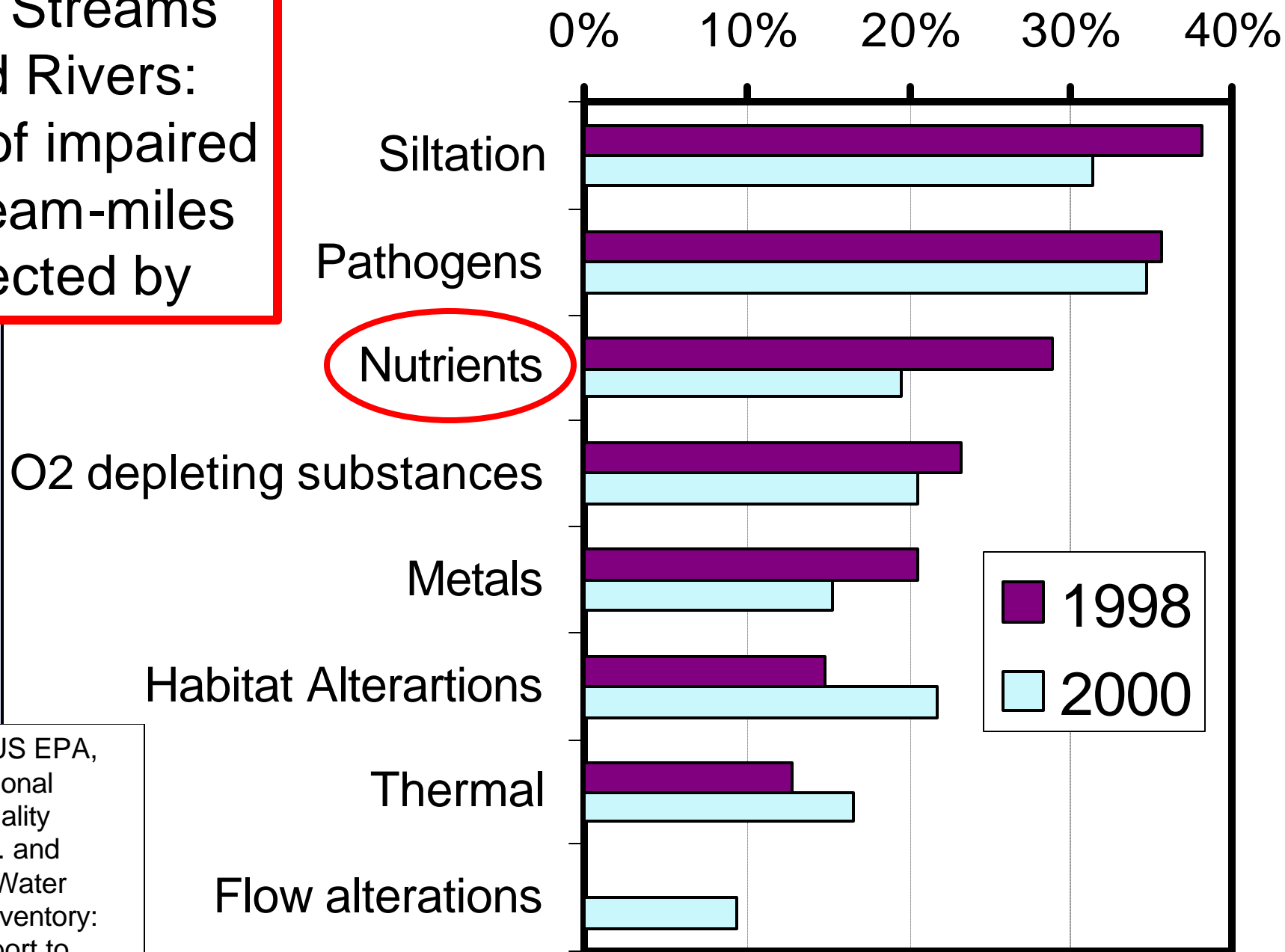
### **Under CWA, Water Quality Standards:** include

- A “designated use” for each water body
- Water quality *criteria*: describe quality of water that will support designated use: Narrative standards and/or numeric limits
  - Antidegradation policy

EPA requires all states to develop *criteria* to protect waters from impairment by nutrients.\*

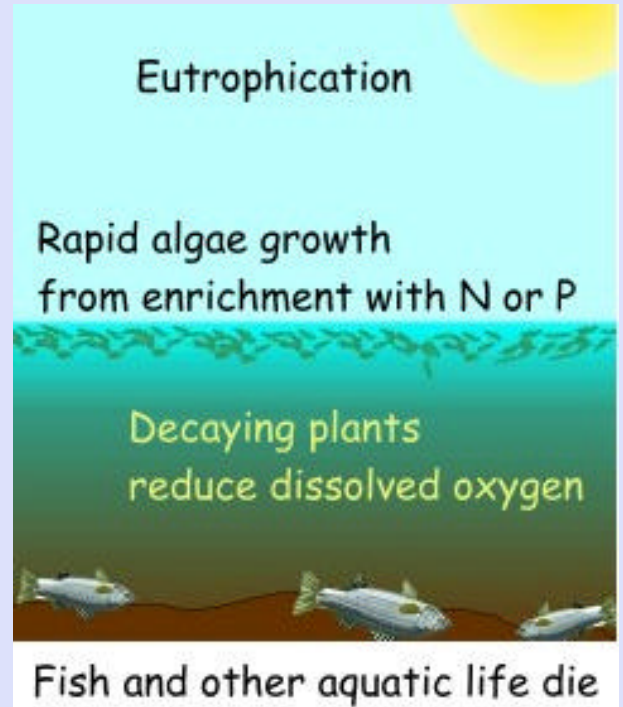
\* See: U.S. EPA. <http://www.epa.gov/waterscience/criteria/nutrient/>  
Also see: <http://www.deq.state.va.us/wqs/rule.html> “Freshwater Nutrient Criteria”

# US Streams and Rivers: % of impaired stream-miles affected by



Source: US EPA,  
2000 National  
Water Quality  
Inventory. and  
National Water  
Quality Inventory:  
1998 Report to  
Congress.

“Algae are either the direct or indirect cause of most problems related to nutrient enrichment” (EPA, 2000)



US EPA. 2000d. Nutrient Criteria Technical Guidance Manual: Rivers and Streams. EPA-822-B-00-001. <http://www.epa.gov/ost/criteria/nutrient/guidance/rivers/index.html>

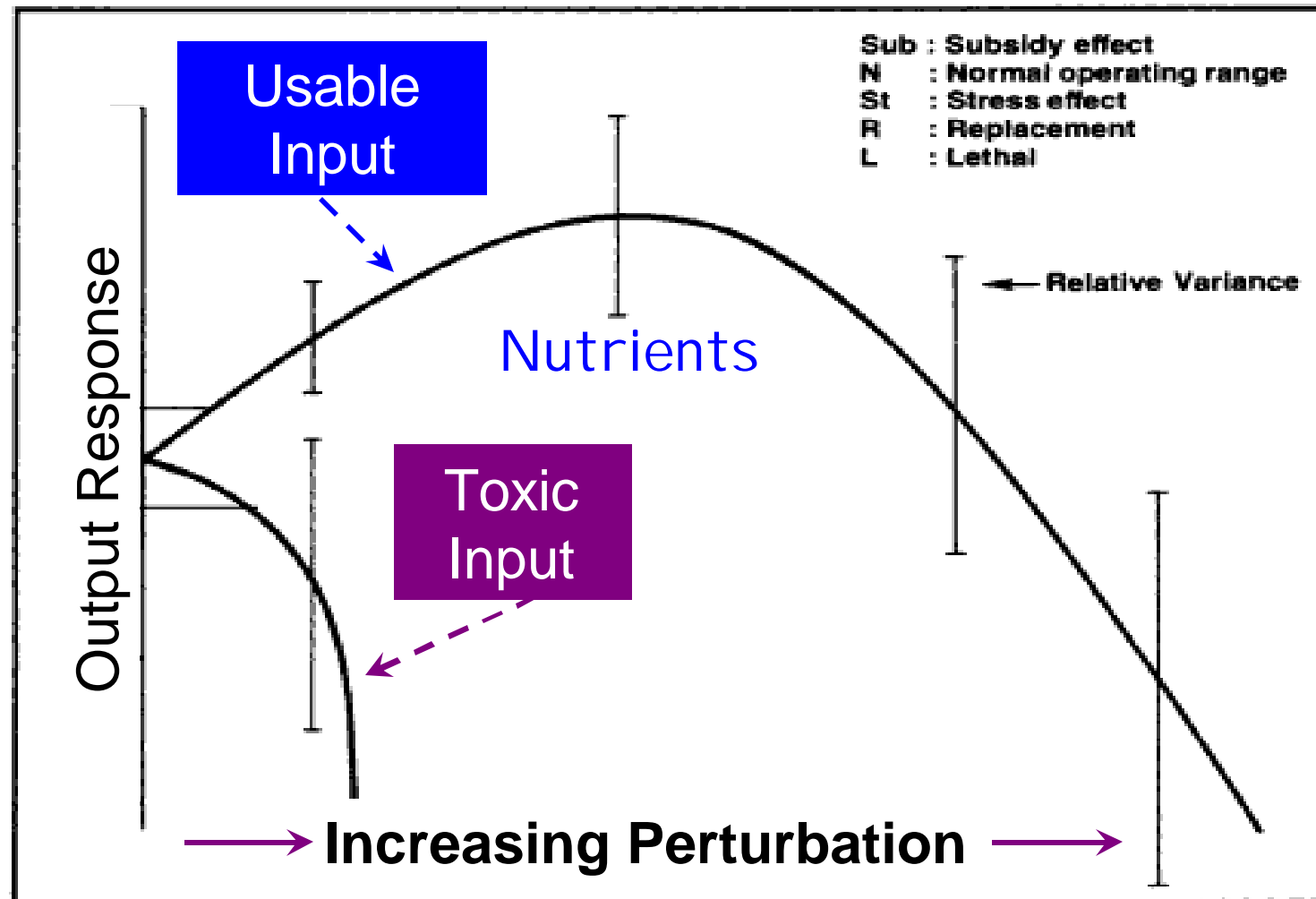


Fig. 1. Hypothetical performance curve for a perturbed ecosystem subjected to two kinds of inputs. The curves simulate the output response (as measured by appropriate systems or component rates of function) to increasing intensity of input perturbation.

Environmental variables act as subsidies or stresses.

# EPA Guidance Criteria for Virginia

<http://www.epa.gov/waterscience/criteria/nutrient/>

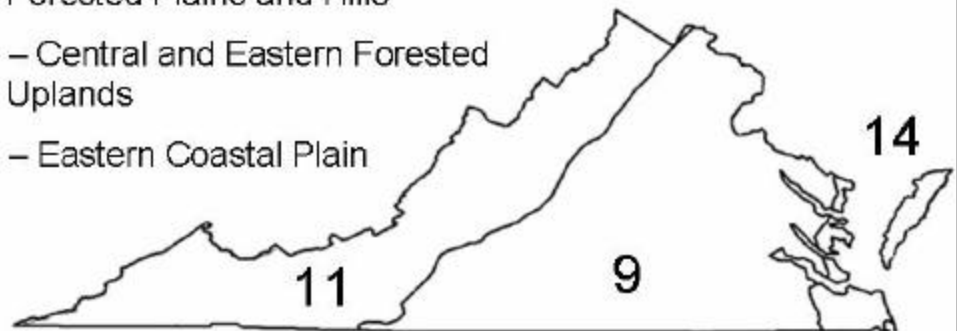
EPA developed “Guidance Criteria” that EPA “may” implement in states that fail to develop their own nutrient criteria in a manner satisfactory to EPA.

Eco-region	TN (mg/L)	TP (µg/L)
11	0.31	10.00
9	0.69	36.56
14	0.71	31.25

9 - Southeastern Temperate Forested Plains and Hills

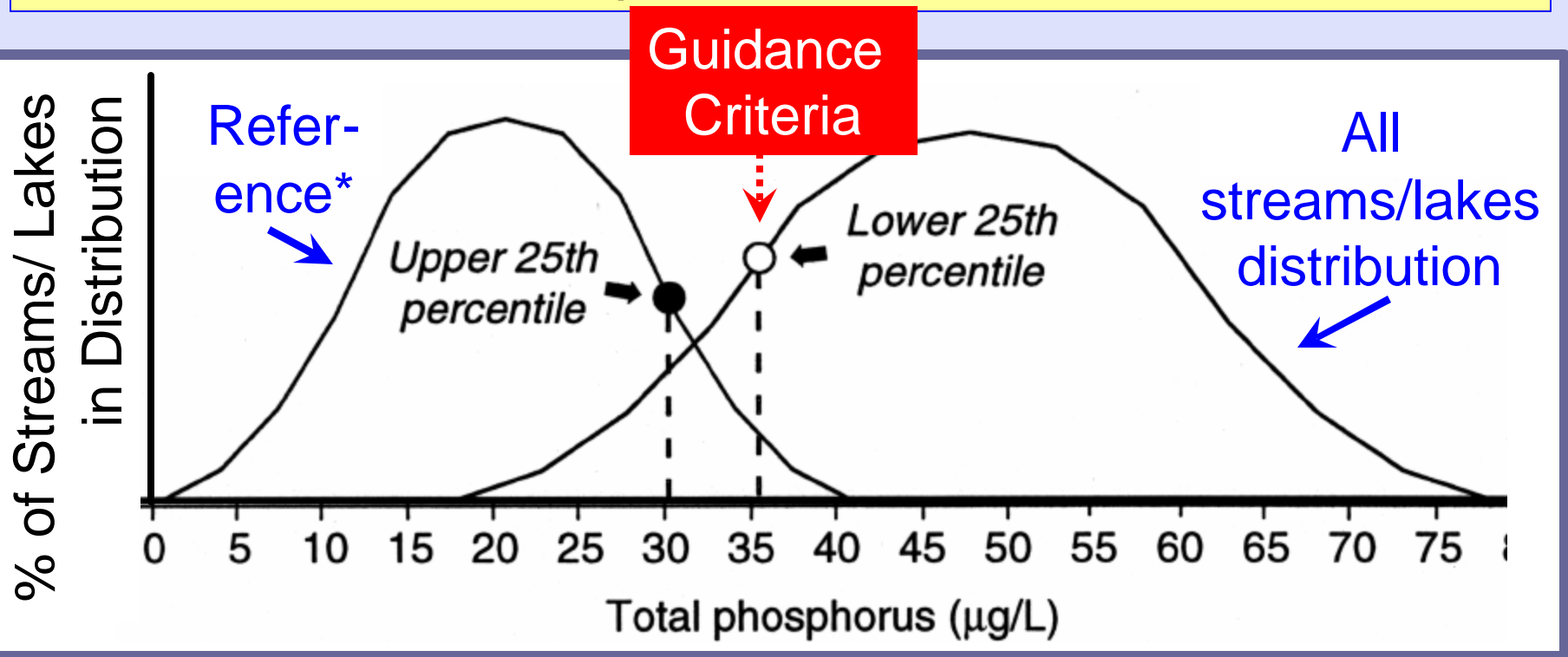
11 – Central and Eastern Forested Uplands

14 – Eastern Coastal Plain





## EPA developed “Guidance Criteria”



Developed by **ecoregion** based on observation that 75<sup>th</sup> percentile of “reference” distribution tends to correspond with 25<sup>th</sup> percentile of “all” streams/lakes distribution.

\* Reference = “relatively undisturbed” or “least impacted.”



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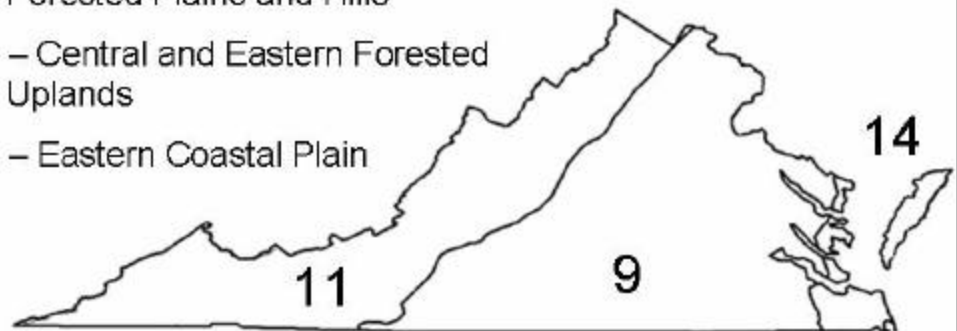
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# Rivers and Streams

Is stream shaded?

Does stream gradient allow re-aeration?

How long since bottom-scouring rain event?

Are conditions suitable for a robust population of grazer insects?



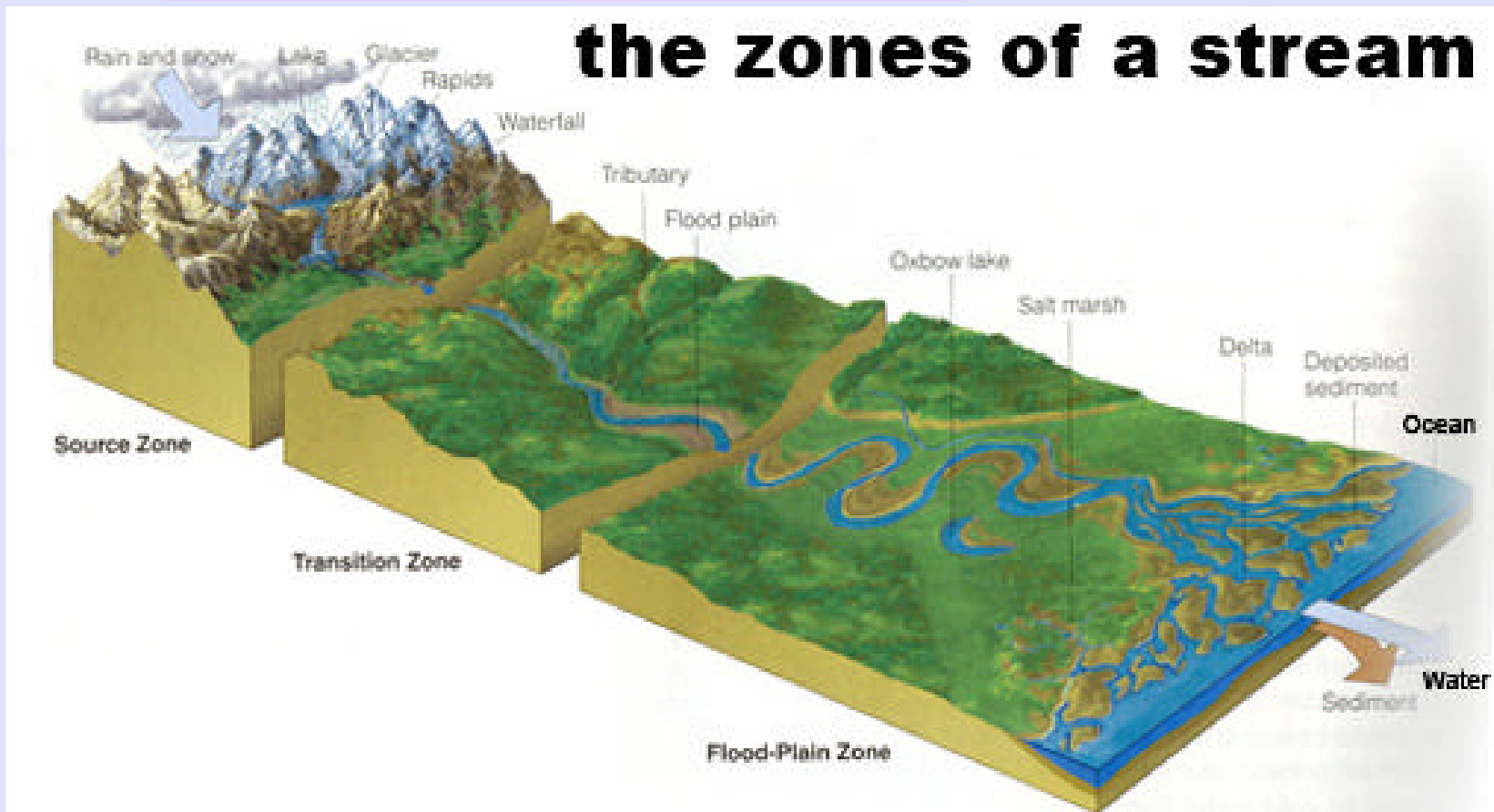
Periphytic algae grow on rocks and stream bottom.

Planktonic algae in the water column

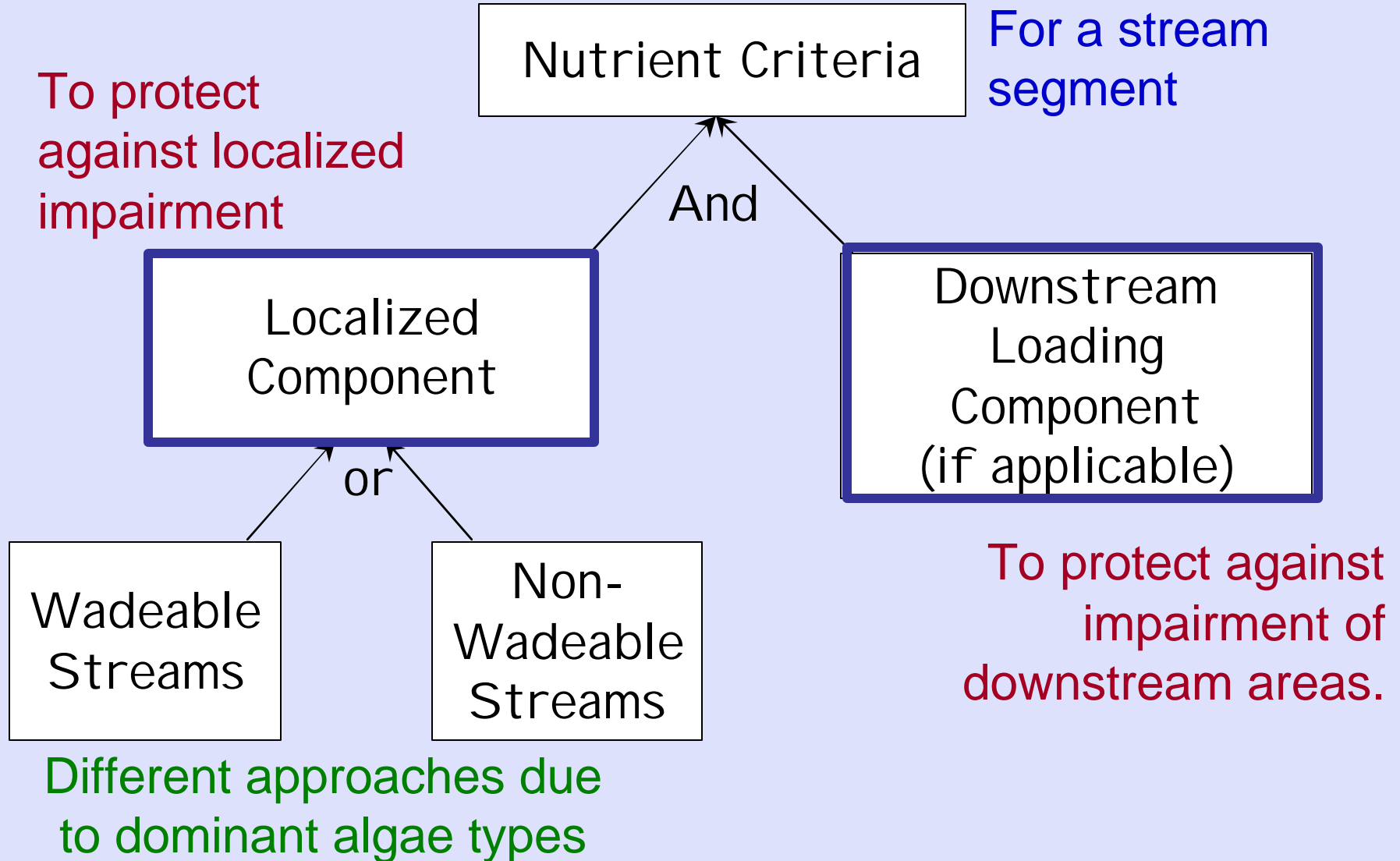
Factors affecting whether or not streams with high nutrient concentrations become nutrient-impaired by excessive algal growth.

Underlying assumption of AAC approach: Streams tend to become more sensitive to nutrients moving from headwaters towards the sea: Downstream areas are:

- Less shaded
- Lower gradient

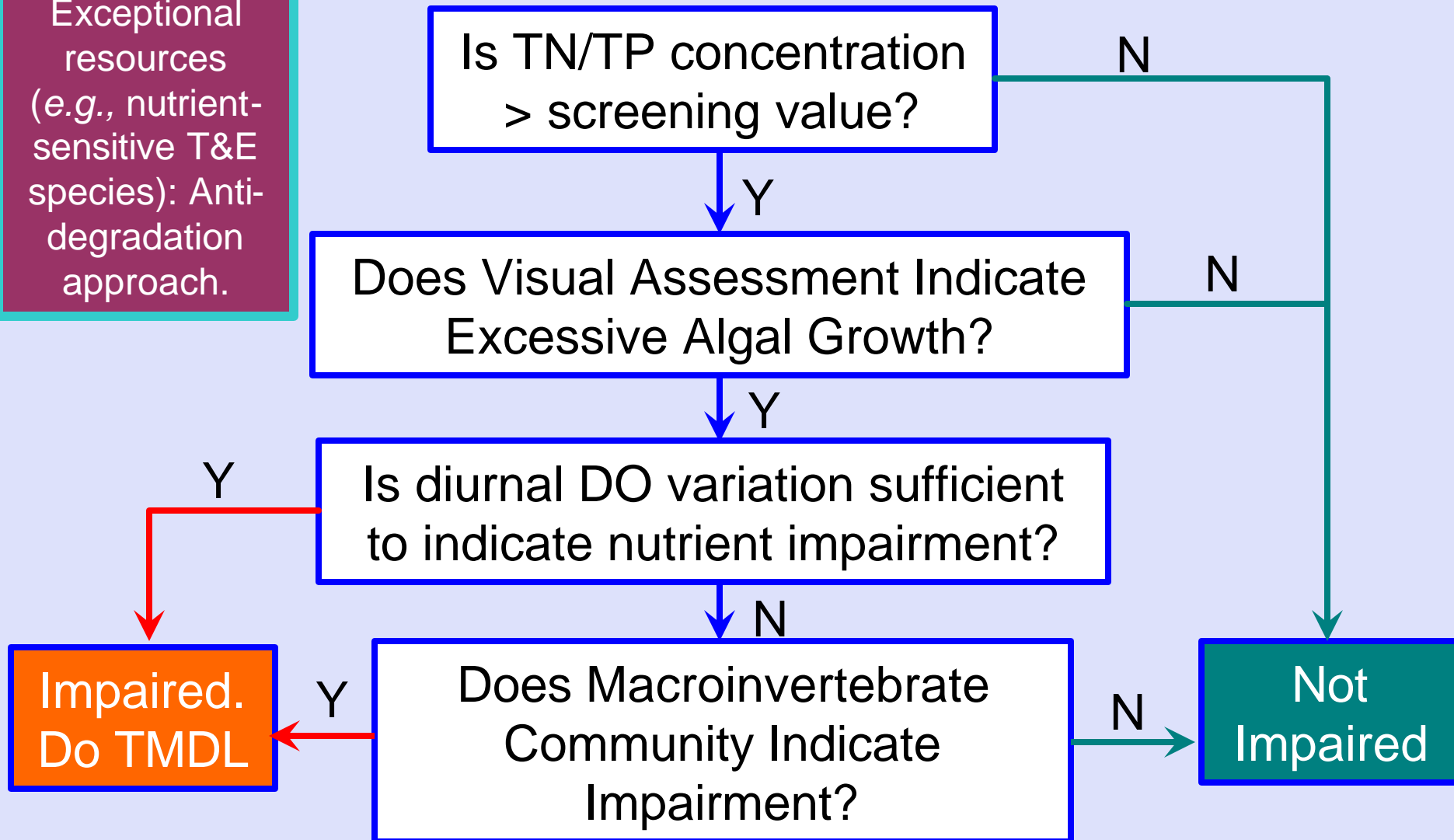


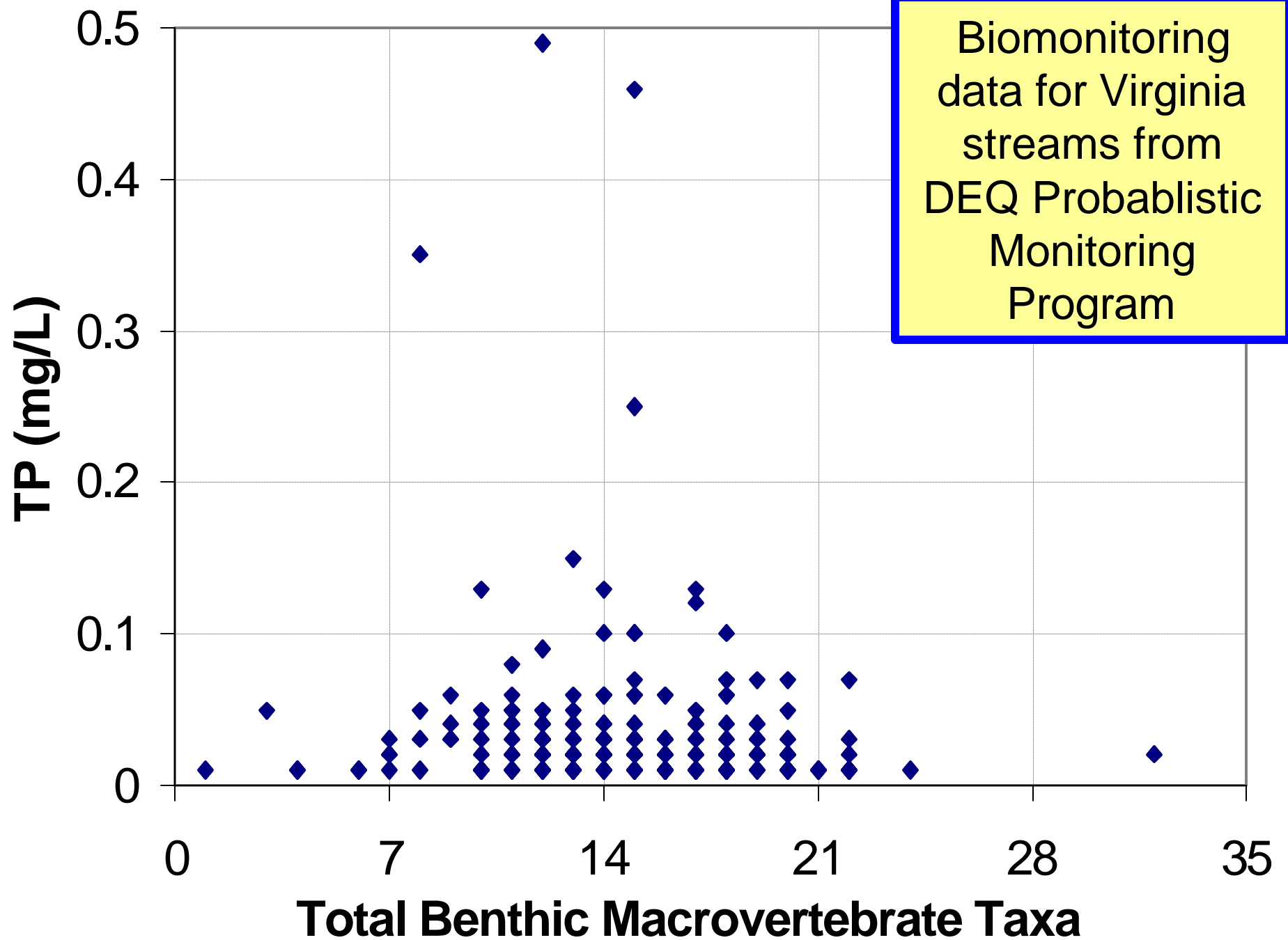
# AAC-recommended Approach - Rivers & Streams



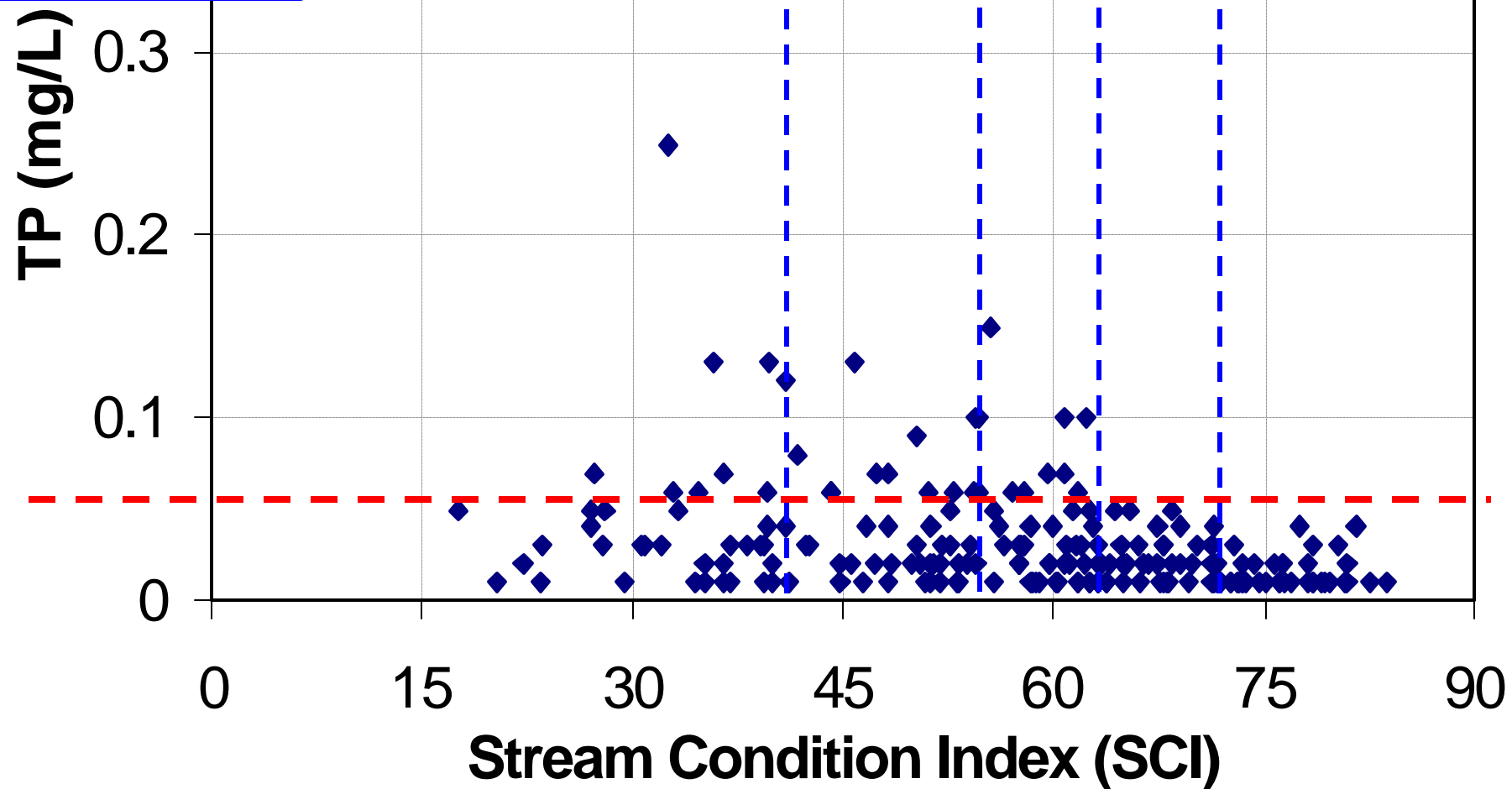
# Localized Component for Wadeable Streams: AAC Recommendation = Staged Approach

Exceptional  
resources  
(e.g., nutrient-  
sensitive T&E  
species): Anti-  
degradation  
approach.





0.05 mg/L  
= possible  
screening  
value  
level??





# Localized Component for Non-Wadeable Streams

Greg Garman at VCU will be conducting a study of existing data, to determine correspondance of in-stream nutrient levels with fish community indices.

# ***Downstream Loading Component:***

80% of the state drains into nutrient-sensitive estuaries.

## Virginia's Major Drainages

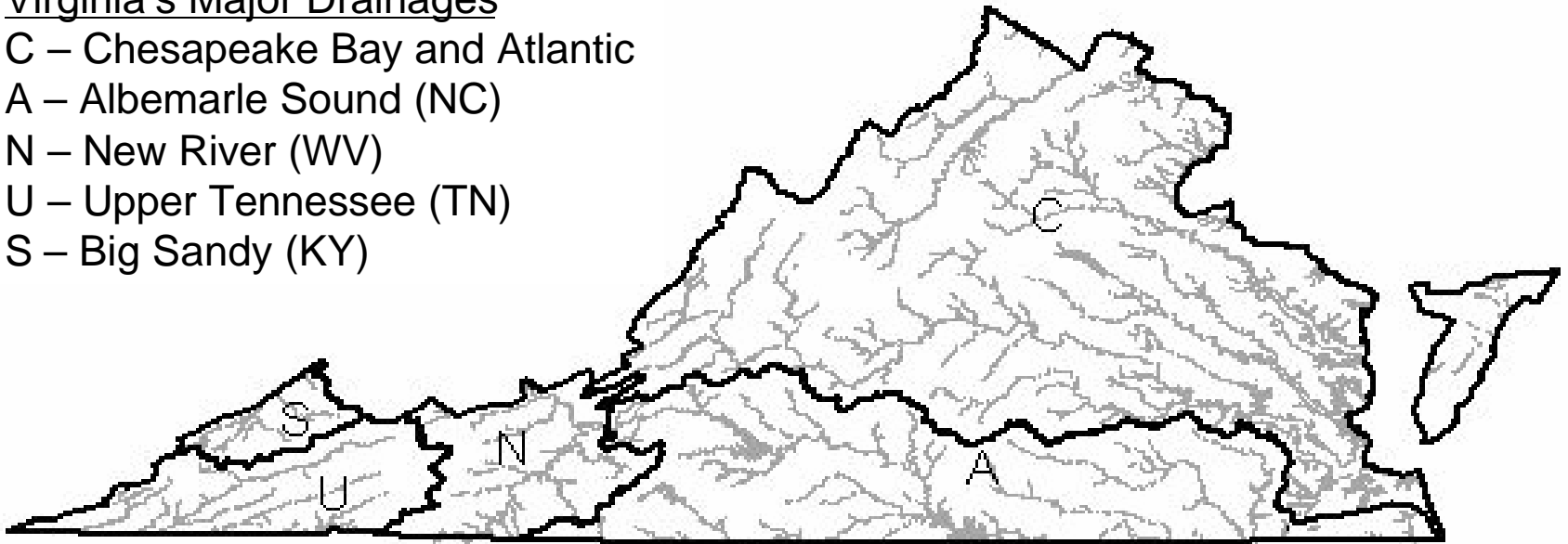
C – Chesapeake Bay and Atlantic

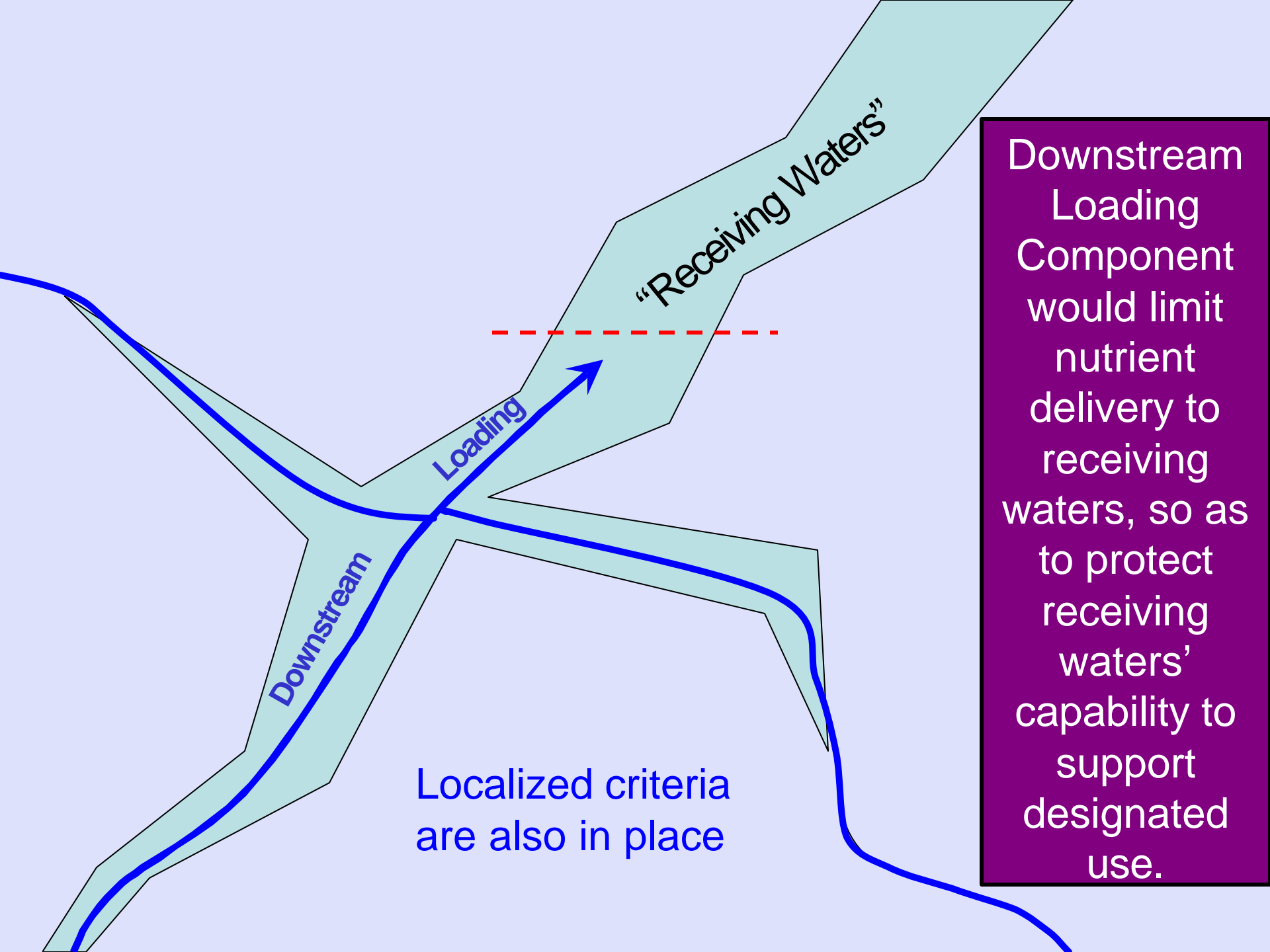
A – Albemarle Sound (NC)

N – New River (WV)

U – Upper Tennessee (TN)

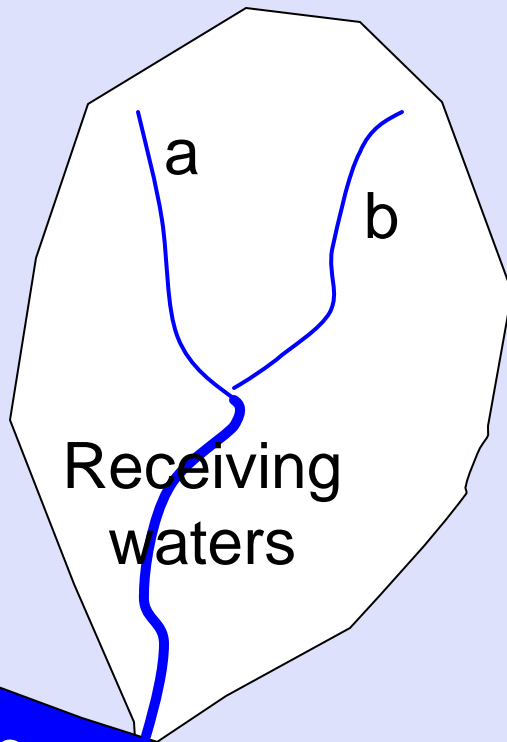
S – Big Sandy (KY)





# How Should Downstream Loading Component be Structured?

Narrative Criteria? “If a given stream segment contributes nutrients to receiving waters that are nutrient-impaired, that segment is subject to potential nutrient reductions imposed by water management program.” (TMDLs).



## Difficulties with Numeric Criteria:

DEQ monitors concentrations, not loadings

Streamflows are not monitored as widely as concentrations.

“Nutrient trading” may alter allowable contributions by individual tribes.

Climatic variability causes concentration / loading variability.

Receiving Waters

Questions?

